Core Flight Software for Unmanned Aircraft Systems, Phase I Project

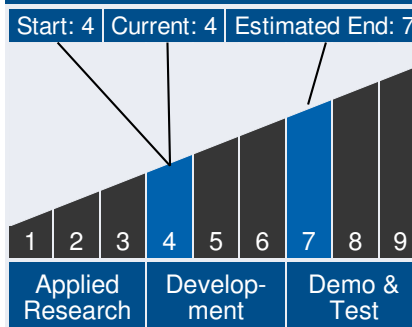SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

Use of Unmanned Aircraft Systems (UAS) is increasing worldwide, but multiple technical barriers restrict the greater use of UASs. The safe operation of UASs in the National Airspace (NAS) will require the vehicle to equipped with sophisticated avionics and flight software. The cost of verifying the flight software required for safe operation is a tremendous barrier to the growth of the technology. Windhover Labs intends to port NASAs Core Flight Software (CFS) to a UAS platform, and use new techniques and tools to lower flight software verification costs. This will provide a safe platform for UAS technology expansion. Windhover Labs intends to extend the existing safety critical pedigree of CFS to UASs. We will develop all the UAS platform specific applications and integrate them into a UAS avionics package. Windhover Labs will certify the CFS framework so application developers need only focus on the verification of their applications. With the basic UAS platform certification taken care of, UAS users can focus on their specific needs like precision agriculture, aerial survey, product delivery, etc. CFS is built around a software bus which allows for straightforward addition of this application specific software. Windhover Labs will also create an embedded test agent. This agent will provide an automated test engine that has access to all the application interfaces. This embedded agent provides an interface and execution platform for application developers to write effective verification tests. Innovative ground control software will enable automating the execution of these tests and the collecting of necessary verification evidence. The CFS framework is a perfect fit for powering the future of UASs in the NAS. Windhover Labs believes that providing this safety critical flight software framework and verification tools tailored for that framework lowers the technology barrier so many new UAS applications can be brought to market affordably.

SPACE TECHNOLOGY

Image Not Available

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Technology Maturity

Start: 4	Current: 4	Estimated End: 7

1	2	3	4	5	6	7	8	9
Applied Research			Develop-ment			Demo & Test		

Management Team

Program Executives:
- Joseph Grant
- Laguduva Kubendran

Program Manager:
- Carlos Torrez

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ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: NASA Commercial Applications and research would greatly benefit from a certified version of CFS for UASs. NASA already has significant in-house expertise in creating CFS applications. With a UAS enabled version of CFS, NASA researchers could more easily use UASs to safely fly their payloads and perform their research. With the embedded test agent and accompanying ground software, NASA would be able to verify their applications quickly and efficiently, reducing the number of defects that escape to the field and lowering the cost of their test programs.

To the commercial space industry:

Potential Non-NASA Commercial Applications: The Non-NASA Commercial market for UASs is ready to explode. Many potential application developers cannot currently overcome the barrier to entry that is presented by safety related concerns. With a safety critical flight software framework in place, they can focus on their problem space without needing extensive flight software experience. A precision agriculture company can focus on their sensors and data processing functions rather than worrying about how the vehicle can safely fly in the NAS. A delivery company can solve the problems associated with mechanizing their delivery process rather than how to get the vehicle to fly safely from source to destination. A certified CFS is to UAS as iOS is to the iPhone. CFS can enable application developers to create solutions that stand on the shoulders of a rock solid platform without having to ascend the learning curve associated with the platform specifics. The Non-NASA market would benefit from the embedded test agent and ground software in the same was that NASA would. Efficient test programs reduce the number of defects and allow for more testing at a lower cost. Thorough testing is the key to the expansion of UASs in the NAS.

Management Team *(cont.)*

Principal Investigator:
- Mathew Benson

Technology Areas

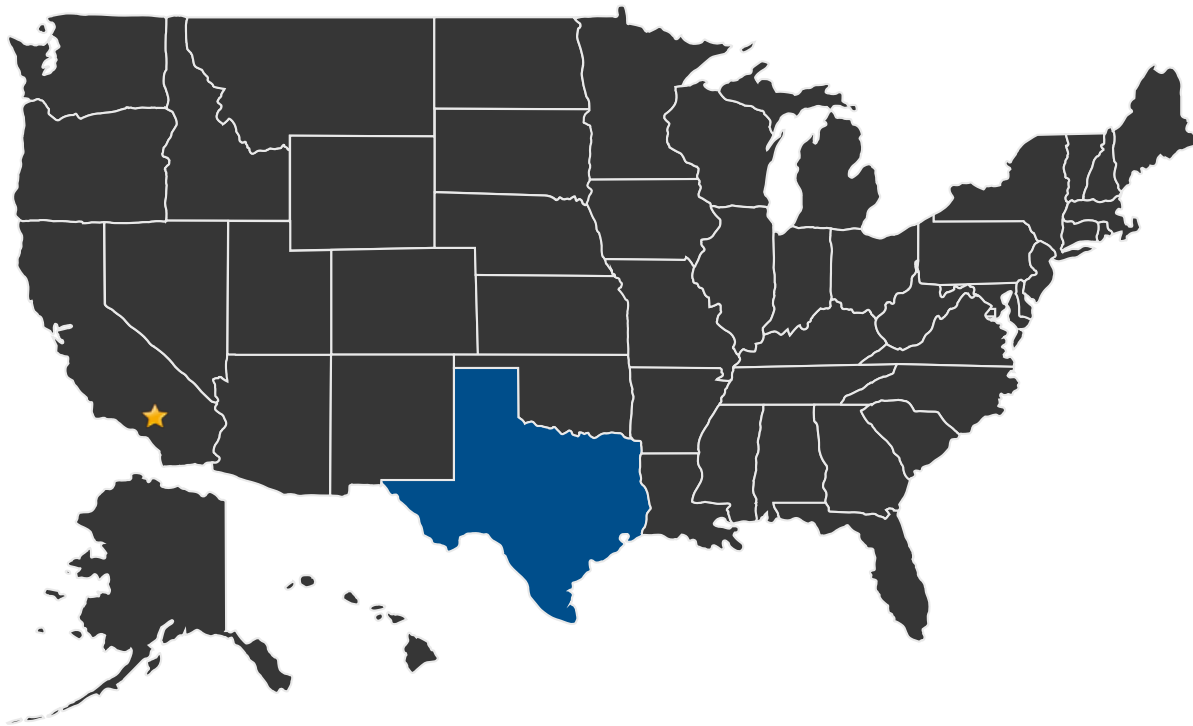**Primary Technology Area:**
Robotics and Autonomous Systems (TA 4)
└ System-Level Autonomy (TA 4.5)

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U.S. WORK LOCATIONS AND KEY PARTNERS

■ U.S. States With Work   ★ **Lead Center:**
                                Armstrong Flight Research Center

Other Organizations Performing Work:

- Windhover Labs (League City, TX)
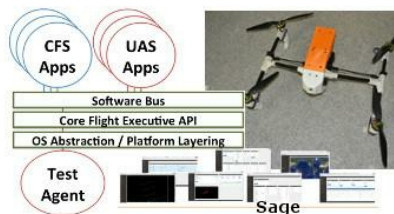
PROJECT LIBRARY

Presentations

- Briefing Chart
    - (http://techport.nasa.gov:80/file/23573)

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IMAGE GALLERY

Core Flight Software for Unmanned Aircraft Systems, Phase I

DETAILS FOR TECHNOLOGY 1

Technology Title

Core Flight Software for Unmanned Aircraft Systems, Phase I

Potential Applications

NASA Commercial Applications and research would greatly benefit from a certified version of CFS for UASs. NASA already has significant in-house expertise in creating CFS applications. With a UAS enabled version of CFS, NASA researchers could more easily use UASs to safely fly their payloads and perform their research. With the embedded test agent and accompanying ground software, NASA would be able to verify their applications quickly and efficiently, reducing the number of defects that escape to the field and lowering the cost of their test programs.